

What is claimed is:

1. A speech synthesis device comprising:

speech database storing means for storing sample waveform data in a speech unit and a speech database created by way of associating the sample  
5 sound waveform data with their corresponding phonetic information;

speech waveform composing means for dividing phonetic information into speech units upon receiving the phonetic information of speech sound to be synthesized, for obtaining sample speech waveform data corresponding to the each phonetic information in a speech unit from the speech database, and  
10 for generating speech waveform data to be composed by means of concatenating the sample speech waveform data in speech units; and

analog converting means for converting the speech waveform data received from the speech waveform composing means into analog signals;

wherein the speech waveform composing means comprises pitch  
15 converting means for converting pitch by means of processing a segment of a waveform in which the waveform is converging on a minus peak during a periodical unit of speech waveform data.

2. A computer-readable storing medium storing a program for  
20 executing pitch conversion using a computer, the program comprising the step of:

processing a segment of a waveform in which the waveform is converging on a minus peak during a periodical unit of speech waveform data, upon receiving the speech waveform data requiring pitch conversion.

25

3. A speech synthesis device comprising:

speech database storing means for storing a speech database having several sample speech waveform data with various pitch lengths for each speech unit and phonetic information associated with the sample waveform  
30 data;

speech waveform composing means for dividing phonetic information

into speech units upon receiving phonetic information of speech sound to be synthesized, for obtaining a desirable sample speech waveform data from among the sample speech waveform data corresponding to the divided phonetic information in a speech unit in the speech database, and for  
5 generating speech waveform data to be composed by means of concatenating the obtained sample speech waveform data in speech units; and

analog converting means for converting the speech waveform data received from the speech waveform composing means into analog signals;

wherein the speech database is constructed of several sample speech  
10 waveform data with various pitch lengths prepared by modifying a contour of a waveform in a segment in which the waveform is converging on the minus peak during a periodical unit of speech waveform data.

4. A computer-readable storing medium storing a program for  
15 executing speech synthesis by means of a computer using a speech database, the program comprising the steps of:

receiving phonetic information of speech sound to be synthesized and dividing phonetic information into speech units;

obtaining a desirable sample speech waveform data from among  
20 sample speech waveform data corresponding to the divided phonetic information in a speech unit in the speech database; and

generating speech waveform data to be composed by means of concatenating the obtained sample speech waveform data in speech units;

wherein the speech database is constructed of several sample speech  
25 waveform data with various pitch lengths prepared by modifying a contour of a waveform in a segment in which the waveform is converging on a minus peak during a periodical unit of speech waveform data.

5. A computer-readable storing medium for storing several sample  
30 speech waveform data with various pitch lengths for each speech unit, wherein the several sample speech waveform data are prepared by

modifying a contour of a waveform in a segment in which the waveform is converging on a minus peak during a periodical unit of speech waveform data.

5           6. The speech synthesis device of claim 1, wherein, within the segment in which the waveform is converging on the minus peak, a largest processing value is provided at around a zero crossing point and a smaller value is provided at a point farther from the zero crossing point.

10           7. The speech synthesis device of claim 1, wherein pitch is one of shortened and lengthened by one of compressing and extending, respectively, the waveform along a time axis in the segment in which the waveform is converging on the minus peak.

15           8. The speech synthesis device of claim 1, wherein waveform processing at around zero crossing point is performed within the segment in which the waveform is converging on the minus peak.

20           9. The speech synthesis device of claim 1, wherein waveform processing at around zero crossing point is performed by one of inserting a substantial zero value segment to lengthen pitch and eliminating a substantial zero value segment to shorten pitch.

25           10. A computer-readable storing medium for storing a speech database, the storing medium comprising:  
a sample waveform data storing area storing sample waveform data of human speech utterances in a speech unit;  
a phonetic information storing area storing the phonetic information associated with the sample waveform data in the speech unit; and  
30           an indicating information storing area that stores information to provide a last zero crossing point before a minus peak in the sample waveform

data.

11. A method of pitch conversion for speech waveform, the method comprising the step of:

- 5 performing pitch conversion by processing waveform in a segment in which the waveform is converging on a minus peak during a periodical unit of speech waveforms.

12. A speech processing device for processing speech waveform in  
10 accordance with entered commands, wherein at least any one of amplitude, fundamental frequency, or duration of speech is modified using corresponding icons or switches of the up arrow, the down arrow, the right arrow, or the left arrow.

13. A computer-readable storing medium storing a program for  
15 implementing a speech processing device for processing speech waveform in accordance with entered commands, the program comprising the step of:  
modifying at least any one of amplitude, fundamental frequency, or  
duration of speech using corresponding icons or switches of the up arrow, the  
20 down arrow, the right arrow, or the left arrow using a computer.

14. A speech processing device for processing speech waveform in  
accordance with entered commands, wherein the up arrow is assigned at least  
to raise fundamental frequency and the down arrow is assigned at least to  
25 lower fundamental frequency.

15. A computer-readable storing medium storing a program for  
implementing a speech processing device for processing speech waveform in  
accordance with entered commands, the program comprising the step of:  
30 assigning the up arrow at least to raise fundamental frequency and  
the down arrow at least to lower fundamental frequency using a computer.

16. The storing medium of claim 2, wherein, within the segment in which waveform is converging on the minus peak, a largest processing value is provided at around a zero crossing point and a smaller value is provided at a point farther from the zero crossing point.

17. The storing medium of claim 2, wherein pitch is one of shortened and lengthened and lengthened by one of compressing and extending, respectively, the waveform along a time axis in the segment in which the waveform is converging on the minus peak.

18. The storing medium of claim 2, wherein waveform processing at around a zero crossing point is performed within the segment in which the waveform is converging on the minus peak.